Fig: 1

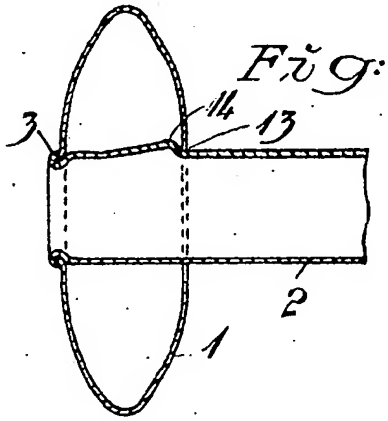


Fig: 2

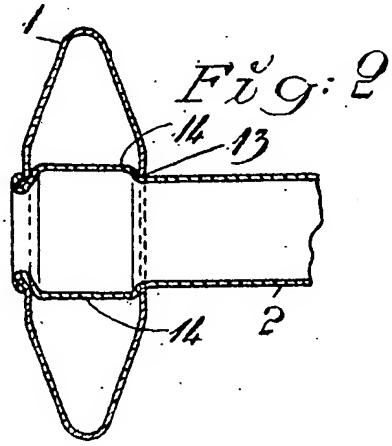


Fig: 3

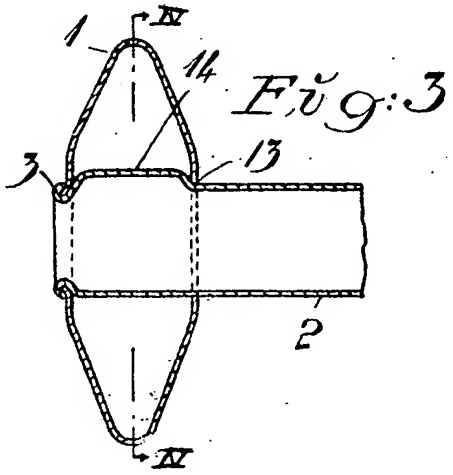


Fig: 4

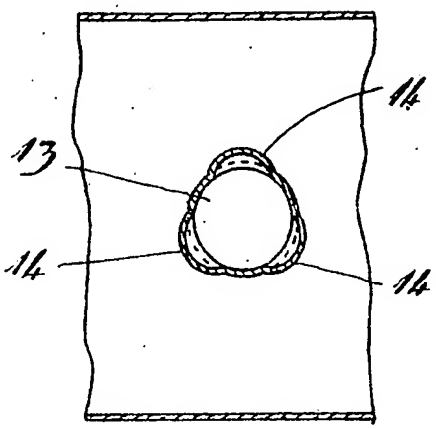


Fig: 5

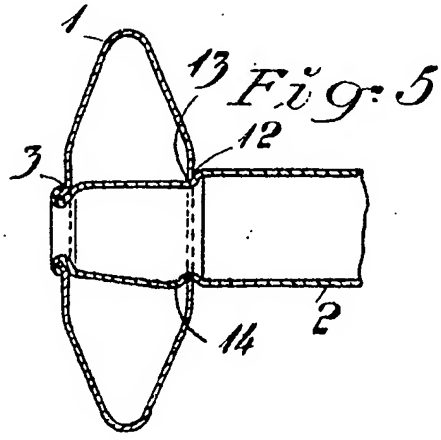
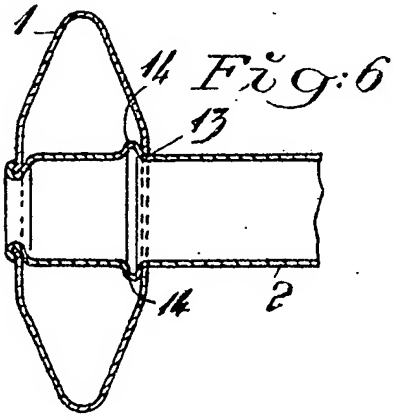


Fig: 6



Malby & Sons, Photo-Lith.

PATENT SPECIFICATION

Convention Date (Sweden): Aug. 12, 1933. **442,729**

Application Date (In United Kingdom): Aug. 13, 1934. No. 23309/34.

(Patent of Addition to No. 384,935: Dated Nov. 5, 1931).

Complete Specification Accepted: Feb. 13, 1936.

COMPLETE SPECIFICATION

Improvements in Ladders

I, ANDERS WIKSTRAND, Manufacturer, of Mora, Sweden, a subject of the King of Sweden, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

According to Patent No. 384,935 the inventor has proposed to make the inner hole of each pair of coincident holes disposed at spaced intervals larger in diameter than its companion outer hole and also to reduce the diameter of the end of the ladder rung or cross-bar in such a manner that there are formed two shoulders on each end so that when the reduced end of the rung is inserted in the companion holes the one shoulder formed by the reduction in the size of the tubing will abut against the outside of the inner flattened wall of the side rail all around the hole in it and the other shoulder against the inner side of the outer flattened side-wall of said rail. When the extreme outer edge of the rung or cross bar is crimped around the edge of that smaller hole an exceedingly light, strong and rigid structure is produced and a turning of the rungs when the latter is in use is prevented.

The chief object of this invention is to gain a stronger and more rigid ladder or like structure without it being essential to form two annular shoulders before the insertion of said end in the side rail. According to the invention the end of the ladder rung or cross-bar, formed with or without a shoulder adapted to abut and bear against the outside of the inner side-wall of the side rail, is between the hole in the inner side-wall of the side rail and the hole in the outer side-wall of the side rail provided with one or more expansions or collars, or the material of the rung is annularly expanded to a larger diameter than the holes in order to form an annular shoulder or the like in such a manner that the shoulder or each expansion rigidly abuts and bears against the adjacent inner side-wall of the side rail and thereby assures a stable fastening of the rung or cross-bar in the side rail.

[*Price* 1/-]

The invention is illustrated in the accompanying drawings showing various constructional forms. In these drawings:—

Figures 1, 2, 3, 5 and 6 show in cross-section side rails of steel tubing each one with the end of a ladder rung inserted.

Figure 4 shows a section at right angles to the section according to Figure 3 and seen in the direction of the arrows IV in said Figure 3.

The holes in the outer and inner side-walls of the side rail 1 are numbered respectively 3 and 13 and the ladder rung numbered 2. In the form of construction according to Figure 5 the end of the rung is before insertion in the side rail formed with two annular shoulders as in the parent patent, the one shoulder 12 intended for abutting and bearing against the outside of the inner side-wall of the side rail. In all the forms shown the extreme end of the rung is crimped to rigidly embrace the edge of the smaller outer hole 3 all around. The rungs according to Figures 1, 2, 3, 4 and 6 are not provided with shoulders corresponding to the shoulder 12 in Figure 5.

After the end of the rung has been inserted in its due position in the side rail a pressing tool is put in the interior of the rung, whereupon a mandrel, wedge or the like tool is driven in for expanding the pressing tool to produce one, two or more expansions or collars 14 to bear against the inside of the inner side of the inner-side-wall of the rail 1 as shown in Figures 1, 3, 4 and 5. Suitably, through rotating the pressing tool in its expanded position an annular expansion or shoulder 14 bearing against the inner side-wall can be obtained as illustrated in Figures 2 and 6.

The details of the invention can naturally be varied, without detracting from the principle of the same.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A ladder or like structure according to Patent No. 384,935 comprising side

rails of steel tubing, the opposite walls of each tubing being provided with pairs of coincident holes at spaced intervals and tubular rungs or cross-bars having their ends extending through said coinciding holes in said side rails, each extreme outer end of each rung or cross-bar being crimped to rigidly embrace the edge of the hole in the outer flattened side-wall all around, and between the said coinciding holes the end of the rung or cross-bar is provided with one or more expansions or collars or the material of said end is annularly expanded to a larger diameter than the holes to form an annular shoulder in such a manner that the shoulder or each expansion rigidly abuts and bears against the adjacent inner side-wall of the side rail and thereby assures a stable fastening of the rung or cross-bar in said rail.

2. A ladder or like structure when provided with rungs or cross-bars constructed and arranged substantially as set forth herein and illustrated in the accompanying drawings.

Dated this 13th day of August, 1934.
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28, Southampton Buildings, London,
England, and
19—25, West 44th Street,
New York, U.S.A.
Agents for the Applicant.

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